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**USATHAMA**

**U.S. Army Toxic and Hazardous Materials Agency**

**Enhanced Preliminary  
Assessment Report:**

**Randolph Army Housing Units  
Randolph, Massachusetts**

September 1989

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prepared for

Commander  
U.S. Army Toxic and Hazardous Materials Agency  
Aberdeen Proving Ground, Maryland 21010-5401

prepared by

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## SUMMARY

The Randolph housing units located in Randolph, Mass., do not present an imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property. No immediate remedial actions are warranted for the site.

This property was originally developed in conjunction with a Nike missile anti-aircraft battery located in Randolph, Mass. However, no wastes associated with the operation and maintenance of the missile-launch and tracking systems have ever been delivered to or managed at this housing property. Furthermore, the housing was completely independent of the Nike battery's operational areas with respect to water, sewer, and electrical utilities. No documentation was found to indicate that the housing units had any utility connection to the other areas of the missile battery.

Despite their repeated malfunctions prior to 1976, the individual septic systems in use until that time have not received hazardous or toxic constituents and are not expected to have caused long-term adverse environmental impacts. Therefore, despite the proximity of some of the housing area's former leach fields to Great Pond, one of the public water supply sources for Randolph, Mass., no further investigations or remediations of the leach fields are warranted.

No further investigative or remedial actions are necessary at this property prior to its release. This conclusion is based on the assumption that the property will most likely continue to be used for residential housing.





## 1 INTRODUCTION

In October 1988, Congress passed the Defense Authorization Amendments and Base Closure and Realignment Act, Public Law 100-526. This legislation provided the framework for making decisions about military base closures and realignments. The overall objective of the legislation is to close and realign bases so as to maximize savings without impairing the Army's overall military mission. In December 1988, the Defense Secretary's ad hoc Commission on Base Realignment and Closure issued its final report nominating candidate installations. The Commission's recommendations, subsequently approved by Congress, affect 111 Army installations, of which 81 are to be closed. Among the affected installations are 53 military housing areas, including the Randolph housing area addressed in this preliminary assessment.<sup>1</sup>

Legislative directives require that all base closures and realignments be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA). As a result, NEPA documentation is being prepared for all properties scheduled to be closed or realigned. The newly formed Base Closure Division of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) is responsible for supervising the preliminary assessment effort for all affected properties. These USATHAMA assessments will subsequently be incorporated into the NEPA documentation being prepared for the properties.

This document is a report of the enhanced preliminary assessment (PA) conducted by Argonne National Laboratory (ANL) at the Army stand-alone housing area in Randolph, Mass.

### 1.1 AUTHORITY FOR THE PA

The USATHAMA has engaged ANL to support the Base Closure Program and assess the environmental quality of the installations proposed for closure or realignment. Preliminary assessments are being conducted under the authority of the Defense Department's Installation Restoration Program (IRP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 91-510, also known as Superfund; the Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499; and the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

In conducting preliminary assessments, ANL has followed the methodologies and procedures outlined in Phase I of the IRP. Consequently, this PA addresses all documented or suspected incidents of actual or potential release of hazardous or toxic constituents to the environment.

In addition, this PA is "enhanced" to cover topics not normally addressed in a Phase I preliminary assessment. Specifically, this assessment considers and evaluates the following topical areas and issues:

- Status with respect to regulatory compliance,
- Asbestos,
- Polychlorinated biphenyls (PCBs),
- Radon hazards (to be assessed and reported on independently),
- Underground storage tanks,
- Current or potential restraints on facility utilization,
- Environmental issues requiring resolution,
- Health-risk perspectives associated with continued residential land use, and
- Other environmental concerns that might present impediments to the expeditious "excessing," or transfer and/or release, of federally owned property.

## 1.2 OBJECTIVES

This enhanced PA is based on existing information from Army housing records of initial property acquisition, initial construction, and major renovations and remodeling performed by local contractors or by the Army Corps of Engineers. The PA effort does not include the generation of new data. The objectives of the PA include:

- Identifying and characterizing all environmentally significant operations (ESOs),
- Identifying property areas or ESOs that may require a site investigation,
- Identifying ESOs or areas of environmental contamination that may require immediate remedial action,
- Identifying other actions that may be necessary to address and resolve all identified environmental problems, and
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.

### 1.3 PROCEDURES

The PA began with a review of Army Housing records located at Fort Devens, Mass., approximately 35 miles northwest of Boston the week of May 15-19, 1989. Additional information was obtained from the Army Corps of Engineers District Office in Waltham, Mass., on May 17 and from conversations with personnel from the office of the Area Engineer, Fort Devens, on May 18. A site visit was conducted at Randolph, Mass., on May 18, 1989, at which time additional information was obtained through personal observations of ANL investigators. ANL investigators revisited the site on August 4, 1989, at which time the interior of one of the units was visually inspected for the possible presence and condition of asbestos-containing materials. Photographs were taken of the housing units and surrounding properties as a means of documenting the condition of the housing units and immediate land uses. Site photographs are appended.

All available information was evaluated with respect to actual or potential releases to air, soil, and surface and ground waters.

## 2 PROPERTY CHARACTERIZATION

### 2.1 GENERAL PROPERTY INFORMATION

The Randolph housing units are located in southeast Massachusetts, in the town of Randolph, county of Norfolk. Figures 1 and 2 show the general location of the facility.<sup>2</sup>

The housing units were built in 1958.<sup>3,4</sup> No additional major construction has taken place on the property since that time. The Army Corps of Engineers Office for the southeast Boston area, located in Waltham, Mass., is responsible for major renovations and upgrading within the facility. Routine maintenance is conducted by the Directorate of Engineering and Housing at Fort Devens.

### 2.2 DESCRIPTION OF FACILITY

Figure 3 presents the site plan of the housing property.

#### Housing Units

The Randolph housing area consists of 16 "capehart" style single-family houses, each with three bedrooms, a family unit, carport, and storage room. "Capehart" is the model name assigned to these houses by the builder, National Homes. The houses are built on concrete slabs with no structures underground.<sup>4</sup> Water lines and air conditioning ducts are imbedded in the foundation slab.<sup>5</sup>

#### Utilities

Since development of the property, the housing units have been supplied with city water; no drinking water wells exist on the property. The property is supplied with electrical power by Massachusetts Electric, which owns all poles and transformers on-site.<sup>5</sup> Garbage is collected by a local contractor for off-site disposal.

#### Sewage

Each housing unit was originally built with a 720-gallon concrete septic tank and leaching field under the backyard.<sup>4</sup> These systems were in operation until 1976, when all the housing units were connected to the city of Randolph's sewer system and the septic systems were abandoned in place.<sup>6</sup> According to a 1975 report by Metcalf and Eddy, Inc.,<sup>7</sup> many of the septic systems in the Randolph area were experiencing chronic failure because of poor soil conditions and, in some cases, density of development. Section 3.1 in this report has more details on the former septic system. Odors, overflows, and the necessity for frequent pumping of septic tank contents were recurring problems.

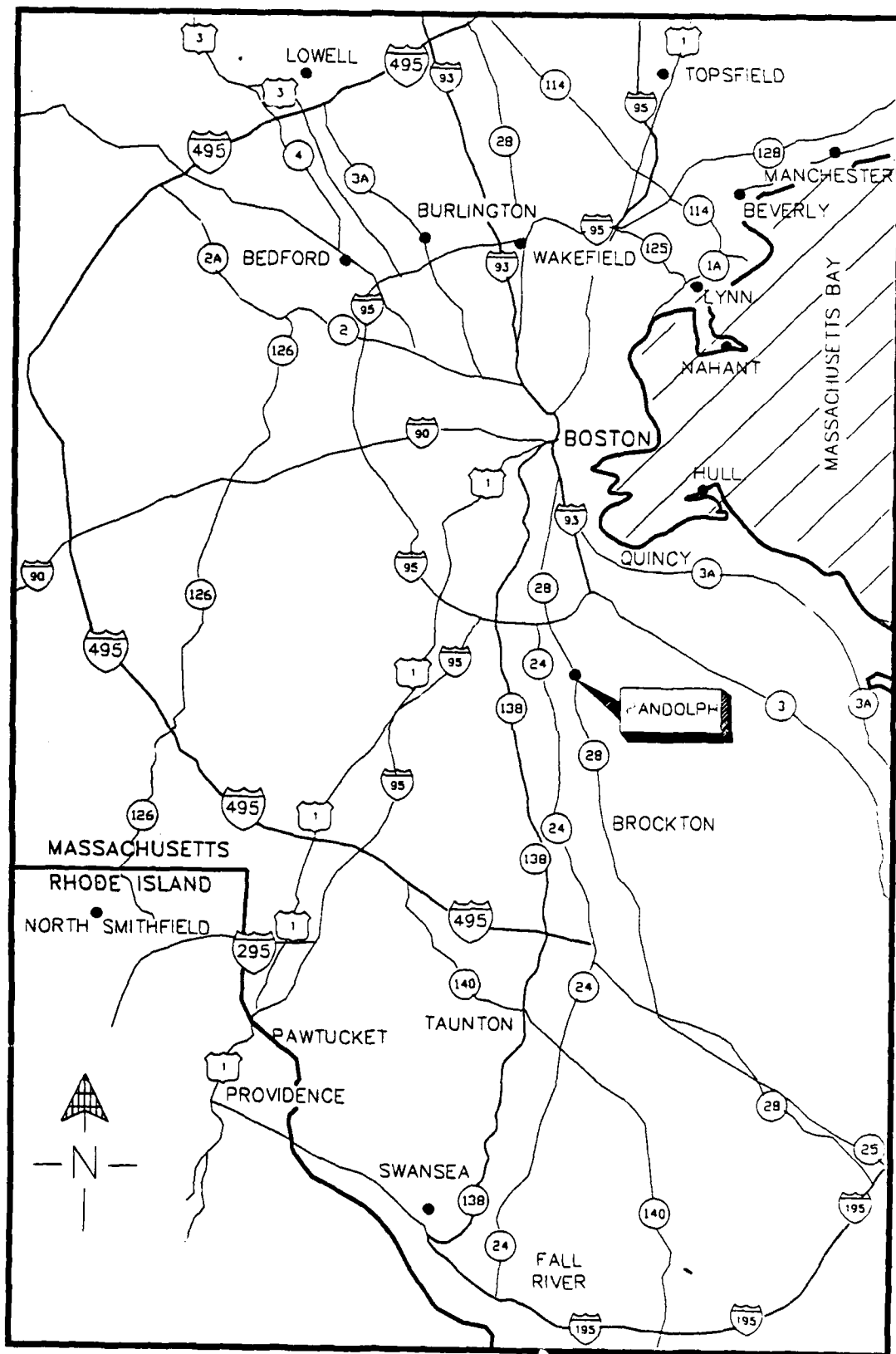
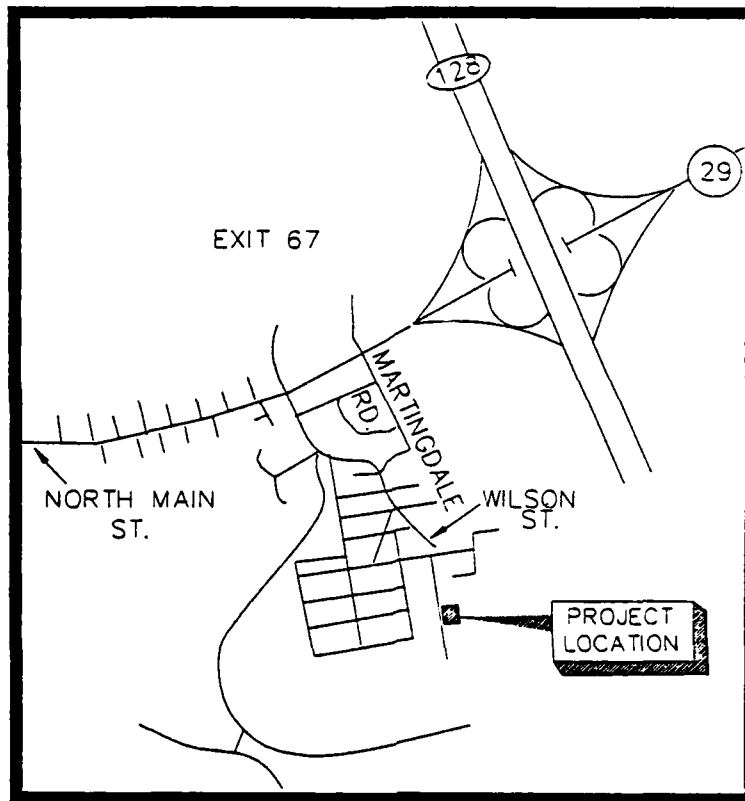


FIGURE 1 Location Map of Massachusetts Army Housing Facilities



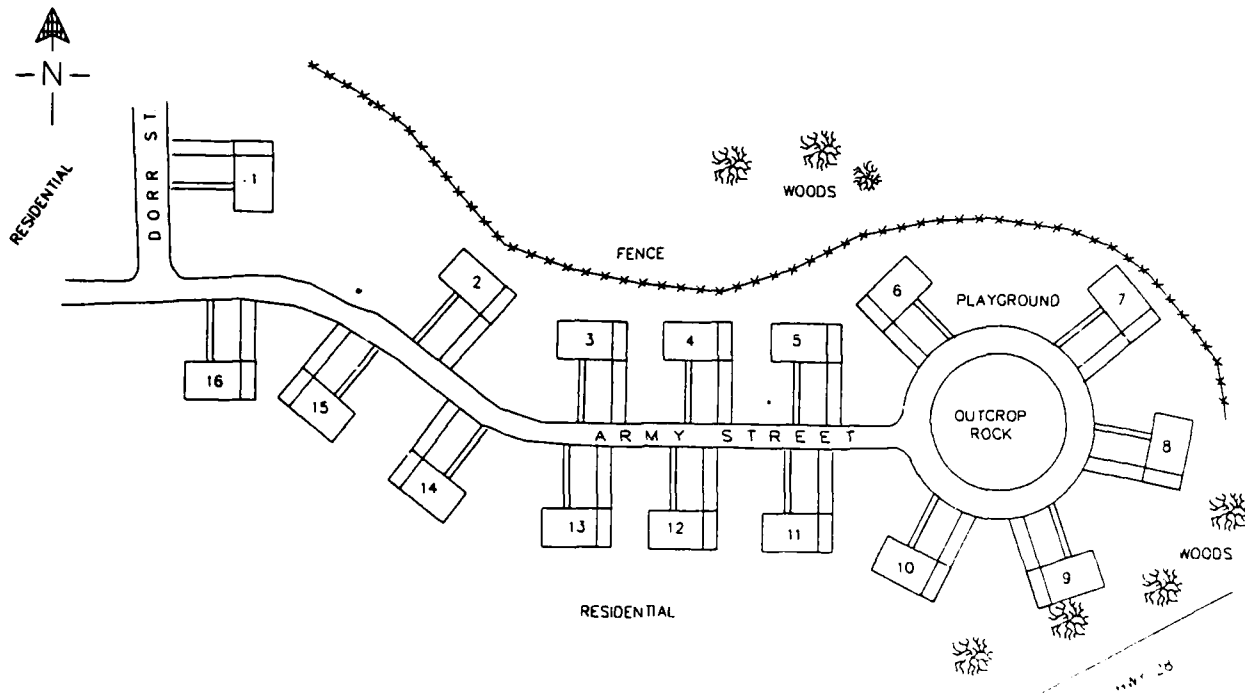
**FIGURE 2 Vicinity Map of Randolph Army Housing Units**

### **Fuel Storage**

Each housing unit originally had a 275-gallon underground storage tank (UST) for heating oil.<sup>4</sup> These tanks were located in the front of each house. In 1986, the New England Corps of Engineers Office, which is responsible for major renovations or upgrading within the facility, contracted to have the underground fuel-oil tanks removed and replaced with above-ground tanks at 108 off-post housing units in the Boston Area. All 16 housing units at Randolph were included in this contract. There is no documentation available to suggest that these underground tanks leaked. Rather, these tanks were removed as a matter of good engineering practice, in recognition of the tanks' advanced ages. The remaining contents of all the underground tanks were removed and transferred into the new above-ground tanks, and the underground tanks were then sold for scrap metal.<sup>8,9</sup> The new 275-gallon above-ground fuel-oil tanks, located behind each house, all appeared to be in sound condition with no evidence of spills or leaks. The only apparent problem with the above-ground tanks is the periodic freezing of the pipes during the winter. Insulation was put around the pipes to help prevent freezing.

### **Storm Drainage Systems**

The property is drained by open ditches or surface run-off, and by the storm sewer running downslope for approximately 400 feet.<sup>3</sup>



**FIGURE 3 Site Plan Map of Randolph Army Housing Units**

#### **Other Permanent Structures or Property Improvements**

No such structures exist, and no major improvements have been made.

### **2.3 PROPERTY HISTORY**

#### **2.3.1 Nike Defense Program and Typical Battery-Level Practices**

Generic information on the national Nike antiaircraft defense program has been compiled in two studies, one commissioned by the Army Corps of Engineers<sup>10</sup> and the other by the U.S. Army Toxic and Hazardous Materials Agency.<sup>11</sup> In both studies, independent contractors relied on information contained in unclassified documents related to the Nike surface-to-air missile program, including engineering drawings and specifications (for the facilities and the missiles themselves), interviews with Army personnel participating in the Nike program, and operations manuals and directives relating to the operations and maintenance of Nike facilities. Taken together, these two reports represent the most complete assemblage of generic information on the Nike missile program from an environmental perspective. Salient points from both reports are condensed below.

At its zenith in the early 1960s, the Nike program included 291 batteries located throughout the continental United States. The program was completely phased out by 1976, with many of the properties sold to private concerns or excessed to state or local governments for nominal fees.



Nike Ajax missiles were first deployed in 1954 at installations throughout the continental United States, replacing, or in some cases augmenting, conventional artillery batteries and providing protection from aerial attack for strategic resources and population centers. Typically, Nike batteries were located in rural areas encircling the protected area. The Ajax was a two-stage missile using a solid-fuel booster rocket and a liquid-fuel sustainer motor to deliver a warhead to airborne targets.

The Ajax missile was gradually replaced by the Nike Hercules missile, introduced in 1958. Like the Ajax, the Hercules was a two-stage missile, but it differed from the Ajax in that its second stage was a solid-fuel rather than liquid-fuel power source and its payload often was a nuclear rather than conventional warhead. Ajax-to-Hercules conversions occurred between 1958 and 1961 and required little change in existing Nike battery facilities. A third-generation missile, the Zeus, was phased out during development and consequently was never deployed.

A typical Nike missile battery consisted of two distinct and separate operating units, the launch operations and the integrated fire control (IFC) operations. The two operating areas were separated by distances of less than two miles, with lines of sight between them for communications purposes. A third separate area was also sometimes part of the battery. This area was typically equidistant from the two battery operating sites and contained housing for married personnel assigned to the battery. Occasionally, these housing areas also contained battalion headquarters, which were responsible for a number of Nike batteries.

Depending on area characteristics and convenience, the housing areas were often reliant on the launch or IFC sites for utilities such as potable water, electrical power, and sewage treatment. In those instances, buried utility lines connected the housing area to one or both of the other battery properties. It is also possible, however, that housing areas were completely independent of the missile launcher and tracking operations. In those instances, the necessary utilities were either maintained on the housing site or purchased from the local community. In many localities, as the character of the land area around the housing units changed from rural to suburban or urban, communities extended utility services to the housing unit locations, in which case conversions from independent systems to community systems were made.

A large variety of wastes was associated with the operation and maintenance of Nike missile batteries. Normally encountered wastes included benzene, carbon tetrachloride, chromium and lead (contained in paints and protective coatings), petroleum hydrocarbons, perchloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethylene. Because of the rural locations of these batteries, and also because very few regulatory controls existed at that time, most of these wastes were managed "on-site." (Unused rocket propellants and explosives, however, would always have been returned to central supply depots and not disposed of on-site.) It is further conceivable that wastes generated at one of the Nike properties may have been transferred to its companion property for management or disposal.

Wastes related to missile operation and maintenance would not have been purposely transferred from a battery operating area to a housing area with no facilities for waste management or disposal. In some instances, however, the sewage treatment

facilities for all Nike battery properties were located at the housing area; that possibility cannot be automatically ignored. Finally, where housing areas received various utilities from either of the operating areas, it is also possible that wastes disposed of on those other properties may have migrated to the housing area via the buried utility lines. And since decommissioning of the Nike batteries did not normally involve removal of buried utility or communication lines, any such contaminant migration is likely to have gone unnoticed.

### **2.3.2 Randolph Housing Units**

The Randolph housing units were built in 1958 to provide family housing for military personnel assigned to the Nike missile battery located in Randolph, Mass. However, there is no documentation indicating that missile-related wastes were ever delivered to or managed at this property. Furthermore, since its original construction, this housing area has operated independently of the rest of the Randolph Nike battery with respect to water, sewer, and electrical utilities.

An inspection of the interior of one of the units on August 4, 1989, revealed that water-pipe insulation was in excellent shape. Several housing area residents confirmed that new pipe insulation was installed in all of the units approximately one year ago by Massachusetts Electric as part of that utility's energy-conservation promotion program. The newly installed insulation does not contain any asbestos.

Sixteen single-family houses were originally erected on the property, each with an individual septic tank and plumbing connecting the tank to an individual leach field in the backyard.

The site investigation revealed that a vinyl siding was placed over the original asbestos siding of each unit; although the date of the action is unknown, this action was confirmed in interviews at the Army Corps of Engineers office in Waltham. It is assumed that the new siding was added for cosmetic reasons and that the original siding was still in good condition and was left in place.

Since the initial property development in 1958, no other permanent structures have been added, and none of the original structures has been razed. Improvements have included installation of smoke/heat detectors in December 1976, renovation of unit bathrooms in March 1989,<sup>4</sup> replacement of the fuel-oil USTs with above-ground tanks in October 1986,<sup>4</sup> and hook-up to the city sewer line in 1976.<sup>6</sup>

## **2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USE**

The housing units are located directly south of the Blue Hills reservation on Army Street, on a small rise overlooking a wetland to the north. The houses are situated on a level area, probably the result of artificial fill, with terracing around each house. The entire property is 6.6 acres, with private residences to the south and west.<sup>3</sup>

The Randolph housing area drains to Great Pond, which is part of the public water supply system for Randolph and the surrounding communities of Braintree and Holbrook.<sup>6,7</sup>

The population of Randolph was estimated in 1984 to be approximately 28,000.<sup>12</sup>

## 2.5 GEOLOGIC AND HYDROLOGIC SETTINGS

Randolph is located in the Neponset River Basin of the Massachusetts-Rhode Island Coastal Region of the New England Physiographic Province. The topography of the area is typified by low, rounded hills rising out of the swampy lowland and by a number of lakes, ponds, and creeks. Lowlands range in elevation from sea-level to approximately 350 feet at the tops of many small rolling hills. Lowlands lack a clearly defined drainage pattern and are poorly drained.<sup>13</sup>

Mean annual temperature is about 50°F. Mean annual precipitation in the area is about 48 inches per year, of which 28 inches evaporates. Part of the remainder travels overland directly to streams and, during or immediately after storm periods, makes up a large part of the increased streamflow. However, most of the water not evaporated or transpired percolates through the ground to the water table and then moves to streams, where it becomes the major component of annual streamflow. Groundwater discharge may be as much as two-thirds of the average annual runoff and, in unregulated streams, is commonly the sole supply for streamflow during low-flow periods. The 1-year 24-hour rainfall is about 2.5 inches in this area.

Soils of the study area have formed since the retreat of the Wisconsin ice sheet.<sup>14</sup> Soil development reflects the influence of glaciation. Generally, the Paxton-Hollis-Canton and the Canton-Paxton-Merrimac soil associations have formed on the upland hills and ridges that are mantled with glacial till. The Hinckley-Windsor-Much association has formed on glacial outwash deposits and the Dune Land-Tidal Marsh-Beaches association has formed along the coast.

Unconsolidated glaciofluvial deposits of sand and gravel constitute the principal aquifers in the area. The crystalline bedrock aquifer beneath the unconsolidated deposits is of secondary importance.

The crystalline-bedrock aquifer consists primarily of igneous and metamorphic rocks, including the Dedham grano-diorite of Devonian age, the Pre-Cambrian Marlboro formation, and Carboniferous-age metamorphic rocks. The rocks have been folded, fractured, and faulted. Bedrock exhibits low porosity, specific yield, and hydraulic conductivity. Wells drilled in bedrock for domestic water supplies are commonly 100 to 300 feet deep and generally yield a few gallons per minute.

The unconsolidated deposits are composed of till, stratified drift, wind-laid, wetland, alluvial, and beach and dune sediments. The till is of two types, an upper till and a lower one. Generally, lower till has a high content of silt and clay and is dense, compact, fine grained, and poorly sorted. Upper till usually contains larger amounts of sand, cobbles, and boulders, a wider range of grain sizes, and is less compact. Both tills

are unfavorable for development of municipal water supplies. Stratified drift consisting of glaciofluvial deposit of ice-contact, outwash, and marine sediments overlies most of the till. Ice-contact and outwash deposits are major water-bearing units in the basin. Ice-contact deposits are predominantly sand and gravel, with small amounts of silt and clay. Outwash deposits are composed mostly of sand, with small amounts of silt, clay, and gravel. Wetland deposits are found overlying outwash in the lowlands, till in the upland depressions, and tidal flats along the coast. They consist of peat and muck intercalated with silt and sand. Porosity of wetland deposits is large, but the vertical hydraulic conductivity is very low. Wind deposits, alluvium, and beach and dune deposits comprise only a small portion of the basin.

Precipitation is the principal source of recharge to the groundwater aquifer. Direct infiltration of rain and snow melt into outcrops of outwash, ice-contact, and wetland deposits acts as the primary recharge mechanism; because of low hydraulic conductivity and steeper slopes, recharge through till and bedrock outcrops is minimal. Discharge of groundwater in the basin is mainly from well pumping, evapotranspiration, seepage to ponds, springs, wetlands, and streams. Water-table levels are generally highest in the late winter and spring and lowest in the late summer and fall.

### 3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

#### 3.1 FORMER SEPTIC SYSTEM

As mentioned earlier, each housing unit was originally built with a 720-gallon concrete septic tank and leaching field under the backyard.<sup>4</sup> These systems were in operation until 1976, when all the housing units were connected to the city of Randolph's sewer system. According to a 1975 report by Metcalf and Eddy, Inc., many of the septic systems in the Randolph area were experiencing chronic failure because of poor soil conditions and, in some cases, density of development. Odors, overflows, and the necessity for frequent pumping of septic tank contents were problems of concern. This housing area drains to Great Pond, which is part of the public water supply system for Randolph and the surrounding communities of Braintree and Holbrook. No documentation was found in the records about how the former septic system at the Randolph housing area was abandoned.<sup>6,7</sup> Furthermore, there is no documentation of adverse impacts on the Great Pond public water supply system resulting from sewage system problems at the Randolph housing area. Since connection to the city sewer system in 1976, no sewage problems have been documented for the housing area.

#### 3.2 UNDERGROUND STORAGE TANKS

Each housing unit was originally built with a 275-gallon underground storage tank (UST) for heating oil.<sup>4</sup> These tanks were located in front of each house. In 1986, the New England Corps of Engineers Office, which is responsible for major renovations and upgrading within the facility, contracted to have the underground fuel-oil tanks removed and replaced with above-ground tanks at 108 off-post housing units in the Boston Area. All sixteen housing units at Randolph were included in this contract. Replacement of these tanks involved transferring all remaining fuels into the new above-ground tanks. The underground tanks were then sold for scrap.<sup>8,9</sup> Soil tests were not performed in the excavations when the USTs were removed, but it has been confirmed that no leaks were discovered in the USTS and no contamination was observed in excavations at the time of tank removals.

The new 275-gallon storage tanks, located behind the houses, appeared to be in sound condition at the time of the site visit, with no evidence of spills or leaks. The only apparent problem with the above-ground tanks is the periodic freezing of the pipes during the winter. Foam rubber insulation was put around the pipes to help prevent freezing.

#### 4 KNOWN AND SUSPECTED RELEASES

Besides the sewage overflow problems occurring in the septic systems prior to 1976, no other release from the facility is known or suspected. No hazardous materials or hazardous wastes have been reported on-site, and no contamination from housing activities has been documented.

During their repeated malfunctions, the septic systems undoubtedly released untreated sewage to the environment. Such releases may also have impacted Great Pond. However, as noted in the 1975 report of Metcalf and Eddy, Inc., such septic system malfunctions were commonplace throughout the Randolph area and not just confined to the Army housing area.

## 5 PRELIMINARY ASSESSMENT CONCLUSIONS

Although these housing units were originally developed in support of a Nike missile battery, all available documentation and circumstantial evidence support the probability that this housing property was completely independent of the Nike battery's operational activities. No missile-related wastes were delivered to this property for management or disposal. Furthermore, since this property was independent of Nike battery operations with respect to utilities, there is no possibility of migration of Nike-related wastes along buried utility lines.

Sewage-treatment problems were successfully addressed in 1976 with the conversion to the city sewer system. Since such septic system malfunctions are not expected to have long-lasting environmental impacts, because no toxic or hazardous constituents are believed to have been introduced into the septic systems, and since no sewage problems have been documented in the area in recent times, no additional investigations or remedial actions are warranted.

Finally, all units have recently received new water-pipe insulation that does not contain asbestos.

## 6 RECOMMENDATIONS

The Randolph housing facility presents no imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property. No immediate remedial actions or additional investigations are therefore warranted prior to the release of this property.

This conclusion assumes this property will most likely continue to be used for residential housing.



## REFERENCES

1. *Base Realignments and Closures*, Report of the Secretary's Commission (Dec. 1988).
2. *Boston Defense Area, Kitchen Renovations, Family Housing Units*, Army Corps of Engineers, Waltham, Mass. (Aug. 1986).
3. *Report of Excess*, Directorate of Engineering and Housing, Ft. Devens, Mass. (May 10, 1985).
4. *Real Property Record-Buildings, Randolph, Mass.*, Directorate of Engineering and Housing, Ft. Devens, Mass. (April 1, 1958).
5. Army Corps of Engineers, Brockton, Mass., personal communication (May 18, 1989).
6. *Historic Properties Reconnaissance for Archaeological Potential of Selected Fort Devens Off-Base Facilities in Connecticut, Massachusetts, Rhode Island, and Vermont*, prepared by M.L. Bourassa and K.A. Atwood, Army Corps of Engineers, Waltham, Mass. (Oct. 1988).
7. *Environmental Assessment of the Proposed Construction of Sewers in the Great Pond Sewer District, Randolph, Mass.*, Metcalf and Eddy, Inc. (Nov. 1975).
8. *Payment Estimate-Contract Performance for Fuel Oil Tank Replacement at 108 Off-Post Housing Units*, U.S. Army Corps of Engineers (Jan. 1988).
9. *Receipt of Disposal of Underground Steel Storage Tanks*, State Scrap Co., Inc. (July 1986).
10. U.S. Army Corps of Engineers, Huntsville Div., *Investigation of Former Nike Missile Sites For Potential Toxic and Hazardous Waste Contamination*, Law Engineering and Testing Company, LEG-Government Services Division, LEG Job #601 (March 1986).
11. U.S. Army Toxic and Hazardous Materials Agency, *Historical Overview of the Nike Missile System*, prepared by B.N. McMaster et al., Environmental Science and Engineering, Inc., for USATHAMA Assessments Div., Aberdeen Proving Ground, Md. (Dec. 1984).
12. *The Municipal Year Book 1988*, Vol. 55, prepared by the International City Management Assn., Washington D.C. (1988).
13. Motts, W.S., et al., *Feasibility of Increasing Water Supplies and Preventing Environmental Damage by Artificial Recharge in Massachusetts*, W.S. Motts, ed., Geology Dept., Univ. of Massachusetts, Amherst, Mass. (1983).

14. Schafer, J.P., and J.H. Hartshorn, *The Quaternary of New England*, in *The Quaternary of the United States*, H.E. Wright and D.G. Frey, eds., Princeton Univ. Press, pp. 113-128, Princeton, N.J. (1965).



**APPENDIX:**  
**PHOTOGRAPHS OF RANDOLPH HOUSING FACILITY**  
**AND SURROUNDING LAND**

**Upper Left-hand Photo**

**Upper Right-hand Photo**

**Lower Left-hand Photo**

**Lower Right-hand Photo**

## RANDOLPH, MASSACHUSETTS

(All photographs for this housing area were taken 5/18/89.)

### Page 1:

Upper left-hand photo: Outcrop circle in the center of the housing area at the end of Army St.

Upper right-hand photo: Surrounding woodlands north of the housing area.

Lower left-hand photo: A typical Capehart-style house with attached carport found at the housing area.

Lower right-hand photo: Surrounding woodlands behind the north property fence of the housing area.

### Page 2:

Upper left-hand photo: View of the housing area from the circle outcrop.

Upper right-hand photo: View of miscellaneous garbage spilled on the hillside of the housing area.

Lower left-hand photo: The slightly hilly landscape of the housing area.

Lower right-hand photo: View of outcrops in the circle end of the housing area.

RANDOLPH, MASSACHUSETTS

(All photographs for this housing area were taken 5/18/89.)

Page 3:

Upper left-hand photo: The surrounding residential land found in the housing area.

Upper right-hand photo: Typical view of Capehart-style house found at the housing area.

Lower left-hand photo: A typical Capehart-style house.

Lower right-hand photo: View looking east, down Army St. in the housing area.

